TWO NEW BRYOPHYTES IN VICTORIA

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Two bryophytes are described, both new to Science and, as far as is known, endemic to Victoria. The first is a moss which is common on tidal salt flats. It has ribbon-like leaves only 5–9 cells wide but up to 10 mm or more long, which are exposed on the surface of the mud, cleistocarpic capsules without a peristome, and relatively large spores with a punctate surface. It is named as *Pottia taeniofolia*. The second is a diminutive, gemmiferous, leafy liverwort, a minor, but common component of bryophyte communities on tree bark. It is named as *Microlejeunea victoriensis*.

THESE two new species, one a moss, the other a liverwort, have hitherto been overlooked by bryologists partly on account of their diminutive size, partly because, in the case of the moss, of its unusual habitat. The original collections were made in the mid nineteen fifties by me and my wife (née S.G. Maisie Fawcett).

In August 1953, I accompanied a student excursion to Anglesea to study seaweeds. The excursion was supervised by the late Mrs (later Dr) S.C. Ducker and was based on the Rover Scout Hut loaned for the occasion by the then chief Rover Scout, Professor Bob Cherry. The route to the sea passed over a bare tidal mud flat, where on the first morning Mrs Ducker stooped to pick up a piece of the surface mud on which she had observed some green filaments, which she suspected to be a filamentous alga.

Later on, back at the temporary lab, she examined the specimen microscopically but discarded it stating that it was not an alga. I immediately took it up, determined to find out what it was and declared it to be a species of moss.

Evidently the plant is unusual in being adapted to withstand the inundation by sea water which occurs at the site at high tides; it is the first truly thalassic moss. My wife and I subsequently decided to search for it at other suitable coastal sites and discovered it again at Cannon's Creek, 3 miles west of Tooraddin, on Western Port Bay. We revisited this area several times during the spring months of 1954 and again in 1955. The site was bounded on the landward side by a zone of coastal tea-tree (*Leptospermum laevigatum*) from which, towards the sea, there was a zone of flat land occupied by a community of small ephemeral angiosperms, characterised by the insectivorous *Polypompholyx tenella* with occasional small fucoid sporelings. The moss did not occur at all in this zone, in which it is evidently unable to compete with the angiosperm vegetation, but only in the next, otherwise rather bare, seaward zone.

The plants are so minute that even to collect specimens it was necessary for one person to collect suitable samples of surface mud while the other used a dissecting microscope to examine them. The earlier samples collected in August had antheridia, and those in September archegonia, but mature sporophytes were not found until October.

When fresh, the miniature capsules were like red pinheads, scarcely emerging above the mud.

Unfortunately, the pressure of other duties prevented completion of the study. It was taken up again in August 2002 during my retirement from the ANU, when my bryophyte collections were returned to me from the Canberra Botanic Gardens. The specimens had by then become somewhat colourless, extremely brittle and difficult to work with.

Methods. The patches of dried mud were soaked for some days in fresh water, then small pieces were excised on to microscope slides. By teasing away the particles of soil the very small, almost stemless plants were revealed. Suitable specimens were mounted in glycerin jelly for examination uing a Nikon photomicroscope, and photographed on Kodak T400 film. Prints were made from which drawings were prepared. Measurements were made with a calibrated ocular micrometer.

(1) Pottia taeniofolia D.J.Carr, *sp. nov.*

Plantae parvae, gregariae, cleistocarpa. Peristomium nullum. Folia taeniformia. Sporae grandes (37–47 µm diam.) In solo limoso aestuarii crescit.

Plants are gregarious on saline mud on coastal (tidal) mud flats. Stems very small (up to 0.45mm), the first few leaves ovate, stem-clasping, ecostate 350 µm long.

Later leaves ribbon-shaped (Fig. 3E-F), the first, 7–9 cells wide, with cells 55 µm long, subsequent leaves narrower (40 µm and 5 -6 cells wide), up to 10 mm long, spreading on the surface of the mud. Under a lens, these ribbon-like leaves are seen to constitute a many-layered thatch of linear filaments completely obscuring the surface of the underlying mud (Fig. 3D). Leaf cells hyaline, lacking completely the verrucose cuticles of certain other *Pottia* species. Perichactial leaves (Fig. 3B) about six, stem clasping, up to 0.6mm long and 415 µm wide at their widest point, spathulate, mucronate, costate, the costa percurrent. The basal cells of these leaves are differentiated in an inverted V-shaped zone extending to the nerve (Fig. 1B). This zone ascends narrowly almost to the tip of the percurrent nerve. It has relatively large cells (80 µm by 40 µm). The cells of the edges and upper part of the leaf are uniform and c.30 µm by 20 µm.

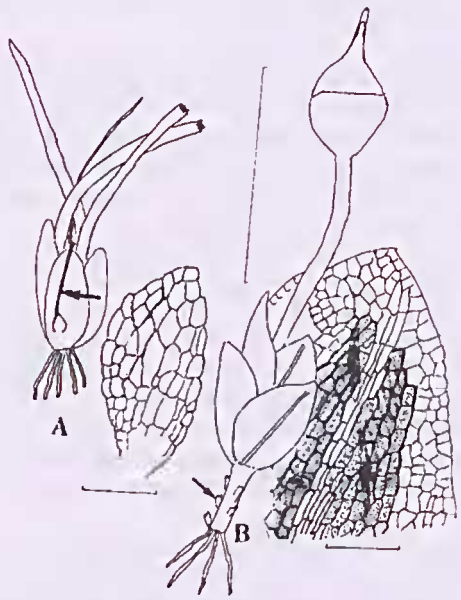


Fig 1. *Pottia taeniofolia*. A, B, whole plants. A Gametophyte phase, arrow indicates archegonium, B Sporophyte phase, arrow indicates bases of shed ribbon-like leaves. Vertical scale bar=10 mm refers to whole plants At A, a basal ecostate leaf. At B a perichaetial leaf, showing the inverted-V zone (shaded) of enlarged cells extending towards the tip of the nerve. Horizontal scale bars = 100 µm, refer to the two leaves.

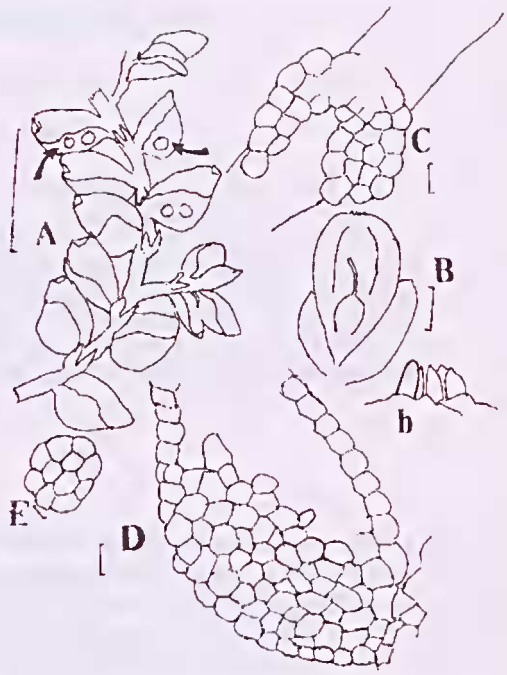
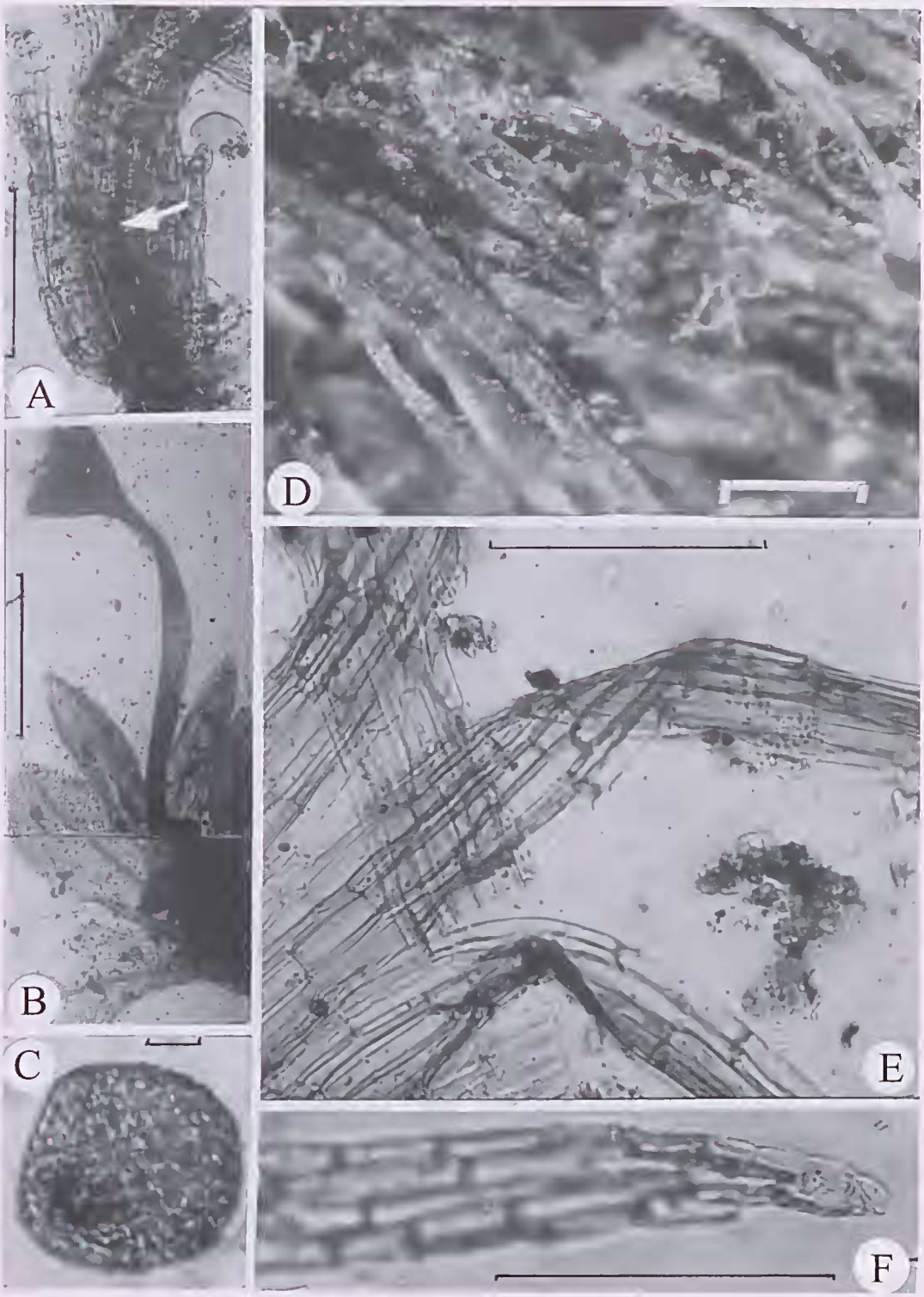


Fig 2. *Microlejeunea victoriensis* A. Whole plant. Arrows indicate immature gemmae within the fold of the postical lobe of the leaf. Scale bar, = 1 mm. B, female perianth, somewhat immature Scale bar = 100 µm. b, rostrum of perianth. C, underleaf. Scale bar = 10µm D, Postical lobe of leaf showing the papillae on its free edge. Scale bar = 10µm. E. Transverse section of stem, Scale bar = 10 µm

The cleistocarpic capsule (Fig 1B) is reddish when fresh, 0.9 mm long, the hollow, curved seta (Fig. 3B) about 2 mm long, 75 µm wide ensheathed at its base by the vaginula (tissue derived from the base of the archegonium, as in *Pottia lanceolata* C.M., illustrated by Goebel (1915–18; fig. 812). The capsule is ovoid with a prominent rostrum (0.2 mm long). The calyptra closely ensheaths the rostrum and upper part of the capsule and is not split longitudinally, nor is it shed after capsule dehiscence. There is no peristome. There are about six stomata on the apophysis of the

Fig 3. *Pottia taeniofolia*. A, Gametophytic plant with an archegonium (arrowhead) B, Sporophyte with dehisced capsule. Scale bars for 1& 2 =1mm. C, Spore. Scale bar =10 µm D, E, F, Ribbon-like leaves, Scalebars = 100 µm. D, seen by dissecting microscope at the mud surface. E and F by transmission light microscopy. F, leaf tip.


A
B
C
D
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F

capsule. The spores (Fig. 3C) are relatively large (37 -47μm in diamerter), larger in some specimens than in others, and some at least are discoid (20 μm deep). The spore surface is minutely punctate all over and also shows tetrad markings.

Holotype. Cannon's Creek, Victoria 29.10 1955, by D.J.and S.G.M. Carr to Herb Melb.

Isotypes: Cannon's Creek (same date and collectors) herb NSW, Herbarium of the Aust.Nat. Bot.Gard., Canberra and the author's herbarium.

Discussion. The new moss is placed in the Genus *Pottia* since it shares a number of characters with other species in that genus. Many of the British and European species of *Pottia* are found only in maritime localities and are generally described as halophytic e.g. *P. heimii*, *P. crinita P. salina*, *P. propagulifera*, *P. commutata* (Dixon, 1924; Gams, 1932). Although none are reported from saline mud. In Australia, *P. drummondii* is described by Scott and Stone (1976) as occurring on clay-pans and salt marshes, and they also refer to an undescribed species from saline clay near Dimboola, around alkaline lakes. At Cannon's Creek there were small patches also of the mosses *Ditrichum difficile* and *Pottia drummondii*, which Catcheside (1980) suggests is synonymous with the New Zealand P. maritima, found in salt marshes. But *P. taeniofolia* is by far the dominant species in the area.

Many *Pottia* species are cleistocarpic or lack a peristome, and the rostrate capsule is borne on a short, often curved seta. All are very small and gregarious with a very short stem. In most the perichaetial leaves have an inverted V-shaped zone of relatively large, differentiated cells. The spores are relatively large with a warty or granular surface (Catcheside, 1980).

The description given above has been drawn up from specimens collected nearly fifty years ago, all parts of which have become extremely brittle with the passage of time. Several questions remain unanswered. It seems probable that the ribbon-shaped leaves grow by a basal meristem, which, initially, may be only one or two cells wide. This is suggested by the fact that the ribbon leaf-tip tapers to a point consisting of only 1 or 2 cells (Fig. 3F). The ribbon leaves are extremely readily detached in handling the dry specimens. These leaves, like the first ecostate basal leaves, may even be shed naturally, leaving a length of bare lower stem (Fig. 1B) during the formation of perichaetial leaves and fructification. Certainly the archegonia are fully formed while the ribbon leaves are present (Fig. 1A, Fig. 3A) and while the first perichaetial leaves are only primordial. The occurrence of stomata on the apophysis indicates the presence of assimilatory tissue. This may be regarded as an adaptation compensating for the loss of the suite of ribbon-like leaves. Stomata have not been reported from the sporophyte of any previously described species of *Pottia* (Goebel 1916–18, p. 882–884; Catcheside, 1980). It remains undecided whether the gametangia are borne on the same or on different plants. To resolve these questions it would be desirable for new and fresh specimens to be collected and studied from existing localities, a task that I must now leave to a new generation of bryologists.

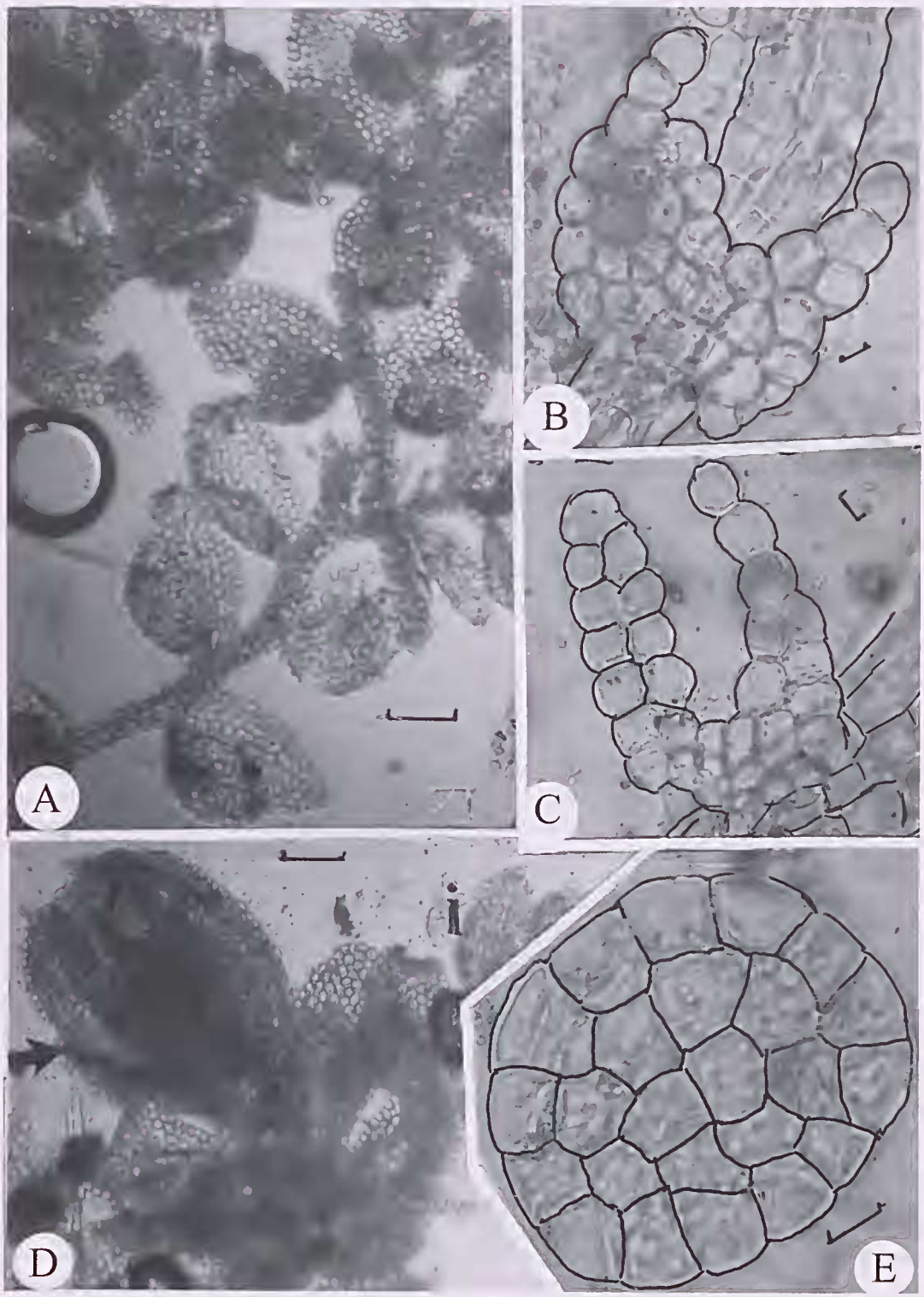
I have not visited the possible sites of occurrence at Port Albert or Corner Inlet, nor the flats of the Glenelg River estuary.

(2.) Microlejeunia victoriensis D.J.Carr, sp.nov.

Plantae parvae, solitariae. Foliorum lobi postici quam antici 2–3plo breviores. Foliorum inferorium lobi angusti (1 vel 2 [3] cellulis lati), non vel moderate divergentes. Gemmae presentes. In cortice arborum (*Banksia, Allocasuarina, Acacia*) aliis brophytarum crescit.

Plants sparse, solitary, very small, up to (but rarely) 5 mm long. Pale green, translucent, creeping, on the bark of rough-barked trees, in association with other bryophytes, especially *Frullania probosciphora*. Branching irregular. Stems not sinuate, with 3 medullary cell rows and 6–8 cortical cells (Fig 2E) 50μm wide. Leaves not imbricate, somewhat distant from each other. Antical lobes ovate, acuminate, 250μm long by 165 μm wide, the tips incurved (Fig 2A). Leaf cells thin-walled, 22μm wide, without trigones or thickened cell walls, with 1–10 minute oil bodies per cell, sometimes in a chain of 7–10. The postical lobes (=lobules) half to one third the size of the antical lobes (=lobes), larger in immature leaves, 225μm long by 100 μm wide, the curved free edge equipped with 2–4 small papillae, each 1–2 cells high (Fig. 2D).

Fig 4. *Microlejeunea victoriensis*. 1 Fragments of 4 plants. Scale bar =100 μm. 2. and 3, Underleaves. 4 Female perianth, somewhat compressed. arrow, perichaetial leaf, i=innovation. 5. Mature gemma. Scale bars for 2–5 =10 μm.


A
B
C
D
E

Amphigastria (=underleaves) (Fig 4B-C) narrowly ovate, 145 x 85 µm deeply incised, not or only moderately divergent, and only very rarely as much as 45o, 1–2 (rarely 3) cells wide, often terminating in a single cell. Rhizoids few.

Mature gemmae (Fig. 4E) ovoid. discoid, 75µm long, 50µm wide, multicellular, initially housed within the postical lobe, especially of leaves near the shoot tip (Fig. 2A). The discoidal gemmae lack an obvious apical cell or an attachment cell or cells. Perianth obovate, 5-plicate, up to 600 µm long, 410µm wide, vey shortly rostrate, the rostrum consisting of a group of single cells (Fig. 2b). Perianth (Fig. 4D) borne at the tip of the stem and succeeded by an innovation from the subjacent stem. Perichaetial leaves about half as long as the perianth, underleaves larger than those on the vegetative stem. Antheridial branches very sparse, very short, almost sessile, perichaetium spherical 175–185 µm diameter. Antheridial branches have been seen only on one specimen and further information on them is necessary.

Holotype. D.J. Carr and S.G.M Carr, on the bark of trees (*Banksia serrata*) at Wilsons Promontory. Victoria. November 1954. Herb. Melb.

Isotypes. B.M.Nat.Hist, Herb, NSW, and Herb. of the Aust.Nat.Bot.Gard., Canberra

Discussion. This plant is a very minor component of common epicortical bryophyte communities on the trunks and branches of trees (*Allocasuarina verticullata, Banksia serrata*). It would appear to be fairly common, as we have found it on trees at Anglesey (*Acacia melanoxylon*), Gembrook, and Kallista and at Wilsons Promontory (on the bark of trees of *Allocasuarina* and *Leucopogon* as well as *Banksia*). It may have been confused with the larger *Harpalejeunea latitans*, which also has acuminate leaves with incurved tips, and with the lobes of the amphigastria 1–2 cells wide. However that species has the lobes of the amphigastria always widely divergent, and also has ocelli at the base of the antical lobes and lacks both gemmae and the special papillae on the free edge of the postical lobe. The only other small *Lejeunea* found on tree bark in Victoria is *Nephelolejeunea hamata* (not illustrated in Scott, 1985) which lacks gemmae and has only one 2-celled tooth on the postical lobe and underleaves with widely divergent, blunt lobes. None of the 73 species of *Microlejeunea* described in Stephani (1912–1917, Vol 5, p. 806–840) has gemmae. Discoidal gemmae occur in various Lejeuneaceae especially those which grow in elevated habitats such as on the bark of trees (Schuster 1984, p. 848). *M. victoriensis* has few rhizoids and lacks totally the "holdfast organs" ("Haftorgane") (formed from fastigiate rhizoids) which are a prominent feature of *Frullania probosciphora* with which it is often associated.

Schuster (1963. p, 246) says that he "retains a conservative delimitation of *Microlejeunea*" while claiming that Bischler et al (1962) is "singularly unconvincing" due to "a series of errors". Mizutani (1962) "does not give *Microlejeunea* the status of a subgenus!" In fact Mizutani not only reduced Taylor's *Microlejeuna punctiformis* to *Lejeunea*, despite admitting that specimens had many times been misidentified as *M. ulicina*, a species used to typify the genus *Microlejeunea* but (*loc cit* p. A199) says "I think *Microlejeunea* is an artificial genus". According to Schuster (1963, p. 207), the taxon is a subgenus of *Lejeunea* characterised by the stems having 3 rows of medullary cells, often dioecious, small and with remote, usually sub-erect leaves, underleaf lobes usually 2–3 (4) cells broad, sometimes ocellate. Apart from the "sub-erect" nature of the leaves (evidently a matter of degree), *M. victoriensis* fits these criteria. Bischler et al (1962) include in *Microlejeunea*, taxa with "stems usually sinuate", with "leaves with insertion with the axis of the leaf parallel or nearly so to the stem" and the lobule reaching 0.4–0.8 of the area of the lobe in "well-developed leaves". Their typification is disputed by Schuster (1963b, p. 249) and is certainly not largely applicable to *M.victoriensis*. Bischler et al (*loc cit.*) maintain that *Microlejeunea* species lack ocelli, as does our new species. The only other *Microlejeunea* species reported from Victoria is *M. primordialis* (Hook f. et Tayl.) which is reduced to *Lejunea primordialis* without explanation by Scott (1985, p. 187), perhaps influenced by Mizutani, whom he cites as an authority on generic distinctions in the family, but see Carr, 2004. According to Scott (*loc cit*), *M.primordialis* has "evident trigones and intermediate (cell wall) thickenings throughout the leaves". It appears from Scott, who found it only once, to be rather rare in Victoria. Schuster (1963b, p. 248) suggests that it is conspecific with *M. aucklandica* in New Zealand. Both species are ignored by Miller et al (1962).

Our knowledge in Victoria of the immense family *Lejeuneaceae*, which has more than 60 genera and sub-genera (Schuster 1983e, p. 587) and 2000 species of world-wide occurrence (Mizutani 1983, p 118. Stephani 1912–1917) is poor. The determina-

tion of the taxonomic status of specimens is fraught with difficulties, and synonymy abounds. The resident Victorian hepaticologist, Mr Pat Bibby, who died in June 1955, usually declined to determine specimens further than to the family, *Lejeuneaceae*.

The treatment of the family at the end of the otherwise excellent treatise on liverworts by Scott (1985) is somewhat perfunctory, and the critical illustrations few. Generic distinctions not found in Scott (1985) are available in Schuster (1963a), a reference omitted from Scott's list.

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Note: *Lejeunea fawcettiae* (Carr 2004) Holo. (Carr, S.G.M. 357) Melb., Iso. B.M.Nat.Hist., Para (Carr & Carr 157) Melb.

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